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Labral Reconstruction with Iliotibial Band Autograft and Semitendinosus Allograft Improves Hip Joint Contact Area and Contact Pressure: An In-Vitro Analysis

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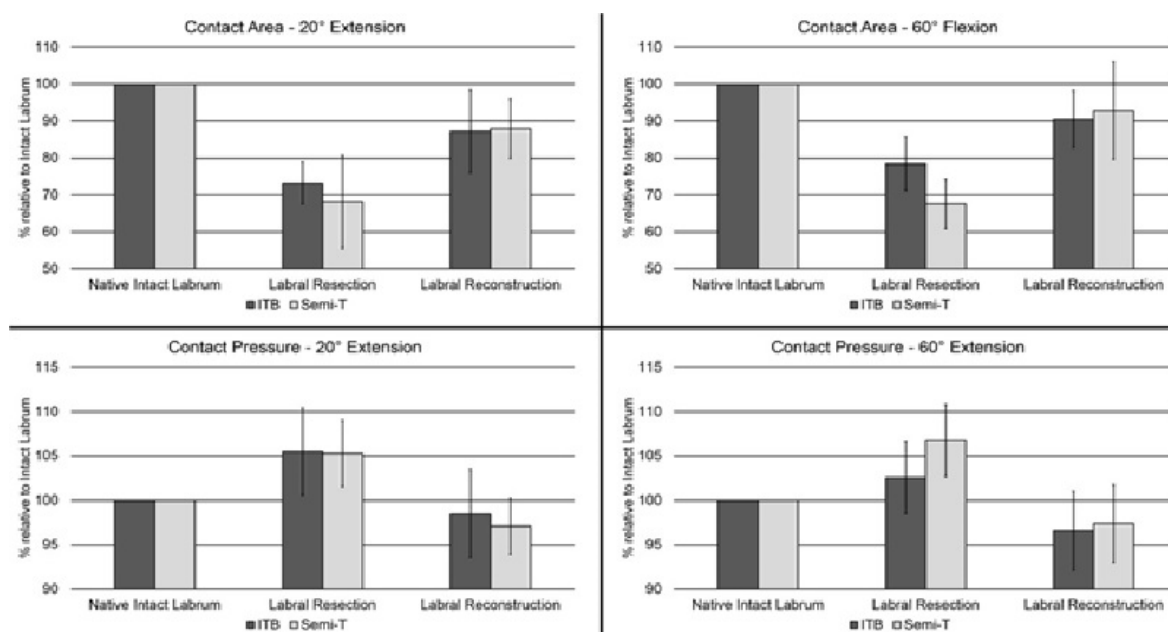
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Objectives: Labral reconstruction using iliotibial band (ITB) autograft and semitendinosus (Semi-T) allograft have recently been described in cases of labral deficiency. The current study seeks to understand the biomechanical effects of an intact labrum, segmental labral resection, and labral reconstruction on joint contact area, contact pressure, and peak force.

Methods: Ten fresh-frozen human cadaver hips were analyzed utilizing thin-film piezoresistive load sensors to measure contact area, contact pressure, and peak force 1) with the native intact labrum, 2) after segmental labral resection and 3) after graft labral reconstruction with either ITB autograft or Semi-T allograft. Each specimen was examined at 20° extension and 60° flexion. Statistical analysis was conducted through one-way ANOVA with post-hoc Games-Howell tests.

Results: For the ITB group, labral resection significantly decreased contact area (20°: 73.2%±5.38, $P=0.0010$; 60°: 78.5%±6.93, $P=0.0063$) and increased contact pressures (20°: 106.7%±4.15, $P=0.0387$; 60°: 103.9%±1.15, $P=0.0428$). ITB reconstruction improved contact area (20°: 87.2%±12.3, $P=0.0130$; 60°: 90.5%±8.81, $P=0.0079$) and contact pressures (20°: 98.5%±5.71, $P=0.0476$; 60°: 96.6%±1.13, $P=0.0056$) from the resected state. Contact pressure at 60° flexion was significantly lower compared to the native labrum ($P = 0.0420$). For the Semi-T group, labral resection significantly decreased contact area (20°: 68.1±12.57, $P=0.0002$; 60°: 67.5%±6.70, $P=0.0002$) and increased contact pressures (20°: 105.3%±3.73, $P=0.0304$; 60°: 106.8%±4.04, $P=0.0231$). Semi-T reconstruction improved contact area (20°: 87.9%±7.95, $P=0.0087$; 60°: 92.9%±13.2, $P=0.0014$) and contact pressures (20°: 97.1%±3.18, $P=0.0017$; 60°: 97.4%±4.39, $P=0.0027$) from the resected state. Comparative analysis demonstrated no statistically significant differences between either graft reconstruction in relation to contact area, contact pressure, or peak forces. (Figure 1).

Conclusion: Segmental anterosuperior labral resection results in significantly decreased contact area and increased contact pressures, while labral reconstruction partially restores time-zero acetabular contact areas and pressures as compared to the resected state. Although labral reconstruction improved the measured biomechanical properties as compared to the resected state, some of these properties remained significantly different compared to the native intact labrum.



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